Substituting in (1), we have

$$e''=\frac{Bs(t-t')}{\frac{w'}{w}DL_{t'}}$$

But $e''=e'-e$

where e' is the vapor pressure corresponding to saturation at the temperature t' and e the vapor pressure of the free air, the thing we are trying to evaluate.

Therefore

$$e=e'-\frac{Bs(t-t')}{\frac{w'}{w}DL_{t'}}$$

But as e is only a small fraction of B it follows that s is nearly the same as the specific heat, and w' approximately the equivalent molecular weight, of absolutely dry air and D a number but little greater than unity. We may therefore assume these limiting values for s, w' and D, and obtain the first approximation to the value of e. We then can correspondingly correct s, w' and D and find a closer value of e, and so on as far as we wish to go. Usually, however, the first approximation to the value of e is (theoretically) correct to less than 1 percent.

Therefore, closely enough for most purposes,

$$e=e'-AB(t-t')$$

where A is a numerical constant, of one value when the wet bulb is covered with liquid water and another when the coating is ice.

THE COLD POLE OF SOUTH AMERICA

By JULIO BUSTOS NAVARRETE, Director

[Observatorio del Salto, Santiago, Chile, October 1933]

(Translated by W. W. Reed)

On account of its geographic configuration, being surrounded by great oceans, South America does not offer conditions favorable for the occurrence of intensely cold weather such as is experienced in Siberia and North America. Nevertheless, the investigations made during 14 years by the Observatorio del Salto have shown that in South America, as in other regions, there exists a cold pole, which is well defined and from which there radiate cold waves every winter.

One naturally would suppose that the most intensely cold weather in South America occurs in Magallanes, the most southerly portion of the continent, but this is not the case. The observations made during many years at stations in Chile and Argentina have shown that the most intense cold occurs in a small zone situated in the interior of the continent, the region limited by the stations of Chos Malal, Lonquimay, Las Lajas, and Bariloche.

The occurrences of very low temperatures are always accompanied by mighty invasions of polar air loosed from the Antarctic front. These enormous air masses, indicated on the meteorological charts by anticyclonic systems of high pressure, often enter the continent between latitudes 40° and 50° S., lingering at times in the region of Aysen, Chiloe, and Llanquihue on account of the natural resistance offered to their advance by the cordillera of the Andes.

Under these conditions the anticyclonic centers usually remain for several days or even weeks over southern Chile, bringing generally fine weather with south or southwest winds, which keep the air clear during the long winter nights. Such meteorological conditions are extraordinarily favorable to rapid loss of heat at night by radiation. The land quickly loses its accumulated heat and for several consecutive nights the minimum temperatures in the open fall gradually and progressively. The masses of cold polar air and their calm and transparency during the long winter nights all favor the loss of heat from the earth. The snow is changed into compact ice, which the feeble rays of the sun of the next day are unable to melt. Hence it accumulates, layer upon layer, after each nocturnal freezing brought by an invasion of polar air.

For these reasons there have occurred in the region bounded by Chos Malal, Las Lajas, Lonquimay, and Bariloche minimum temperatures of −32° C. in standard shelters and −40° C. in the open with clear sky. This zone constitutes what is known as the cold pole of South America, and from this region there radiate the cold waves that in severe winters often invade the central valley of Chile and the pampas of Argentina.

As the cold pole in our hemisphere is always situated northeast of the center of high atmospheric pressure, or anticyclone, the diverging waves of icy air spread low temperatures to the remainder of the southern part of the continent. On the meteorological charts of South America it is possible to follow, day by day, the advance of these waves of cold air that moderate little by little until they reach the equatorial regions.

AN AID IN LOCATING AND STUDYING CLOUDS

By IRVING F. HAND

[Weather Bureau, Washington, November 1933]

In studies of solar radiation, it often is essential to know whether the ever-present haze is without form, or owing in part to definite clouds. A Nicol prism mounted at the eye end of a tube (the latter to cut off extraneous light) is not only of great help in locating clouds of indefinite form, but also resolves details of an intricate kind that ordinarily would remain undetected.

The writer recently made a simple instrument of this nature and tested it with the aid of several casual observers. Filters of various colors were tried in the optical train and while theoretically red should give the best results, the consensus of opinion was that the instrument worked better without any filter. In several instances clouds were rendered visible within the area of maximum polarization that could not be seen with the naked eye.

This "cloud finder" has its limitations as shown by the theory of skylight polarization. Generally speaking, maximum polarization occurs in a plane at right angles to the direction of the incident solar rays, but the percentage decreases as we get away from a point 90° from the sun. Thus with the sun on the horizon the maximum polarization occurs in the zenith. At that point it is plane-polarized vertically, while on the horizon at right angles to the sun's direction, that is, to the north